

IQSE AMO QO Seminar Series

Tuesday, December 14, 11:30 am ZOOM &
IQSE seminar room (MPHY 578)

Pizza will be served for IQSE members at 11:00 am. The talk will start around 11:30 am

Prof. Jonathan Oppenheim

University College London

Gravitationally induced decoherence vs space-time diffusion: testing the quantum nature of gravity

EVENT DETAILS: We consider two interacting systems when one is treated classically while the other system remains quantum. Consistent dynamics of this coupling has been shown to exist, and explored in the context of treating space-time classically. Here, we prove that such hybrid dynamics necessarily results in decoherence of the quantum system, and a breakdown in predictability in the classical phase space. We further prove that a trade-off between the rate of this decoherence and the degree of diffusion induced in the classical system is a general feature of all classical quantum dynamics; long coherence times require strong diffusion in phase-space relative to the strength of the coupling. Applying the trade-off relation to gravity, we find a relationship between the strength of gravitationally-induced decoherence versus diffusion of the metric and its conjugate momenta. This provides an experimental signature of theories in which gravity is fundamentally classical. Using bounds on decoherence rates arising from current interferometry experiments, our estimates already place significant restrictions on theories where Einstein's classical theory of gravity interacts with quantum matter.

ZOOM information:

<https://tamu.zoom.us/j/98156251523?pwd=QVdSdGxtL1UyY0g1L083SU5QR0QrUT09>

Meeting ID: 981 5625 1523

Passcode: 297578

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